
Strengthening Local Wisdom Through Artificial Intelligence And Green Innovation: A Case Study Of *Grebek Apem* Jombang For Sustainable Cultural Tourism

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Article Information		Abstract
Submission date	4 February 2026	Research aim : To explore strategies for strengthening local wisdom through the integration of artificial intelligence and green innovation, using <i>Grebek Apem Jombang</i> as a case study to support sustainable cultural tourism in ASEAN. Design/Method/Approach : This study uses a qualitative case study approach with data collected through literature review, observation of the <i>Grebek Apem</i> event, documentation, and interviews. Data were analyzed using reduction, categorization, and triangulation techniques. Research Finding : The study finds that <i>Grebek Apem</i> has strong cultural value but limited visibility. AI based digital branding can enhance promotion and engagement, while green innovation supports environmental sustainability. The integration of these elements can strengthen its potential as a tourism destination. Theoretical contribution/Originality : This research proposes an integrated framework combining local wisdom, artificial intelligence, and green innovation in cultural tourism, offering a holistic and interdisciplinary approach. Practitioner/Policy implication : The findings suggest the need for AI-driven digital marketing, community-based tourism development, and sustainable event management supported by government policies and infrastructure. Research limitation : The study is limited to a single case and qualitative analysis. Future research is recommended to use quantitative methods and comparative studies across regions. Keywords : Local wisdom, artificial intelligence, green innovation, cultural tourism, ASEAN sustainable economy, <i>Grebek Apem</i>
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1. Introduction

In the era of rapid digital transformation, the preservation of local cultural wisdom has become an increasingly important issue, particularly in developing countries with rich cultural diversity such as Indonesia. Globalization and technological disruption have

significantly influenced cultural practices, often leading to the marginalization of traditional values and local identities [1]. However, this phenomenon also creates opportunities to revitalize local traditions by integrating them with modern technologies and innovative approaches. Cultural heritage, when properly managed, can serve not only as a symbol of identity but also as strategic asset for tourism development and economic growth. In this context, local cultural events have the potential to be transformed into attractive tourism destination that contribute to sustainable development.

One example of such cultural heritage is *Grebek Apem*, a traditional event in Jombang that reflects strong religious, social, and cultural values. Despite its uniqueness and cultural significance, *Grebek Apem* has not yet been optimally developed as a sustainable tourism attraction. In contrast cultural event such as *Ogoh-ogoh* in Bali have successfully gained national and international recognition, attracting a large number of tourists and contributing significantly to the local economy. This indicates that local traditions can be transformed into competitive tourism assets when supported by appropriate strategies, including effective branding, community involvement, and innovation. Therefore, it is essential to explore hoe *Grebek Apem* can be strengthened and repositioned as a sustainable cultural tourism destination.

Previous studies have highlighted the importance of integrating local wisdom into tourism and product development as a means of creating unique value and competitive advantage [2], [3]. Local culture plays a significant role in shaping consumer perceptions and enchancing the attractiveness of cultural products and experiences [4]. In addition, the concept of *smart tourism* emphasizes the role of digital technologies, particularly Artificial Intelligence (AI), in improving marketing effectiveness, enchacing tourist experiences, and increasing destination competitiveness [5]. AI enables data driven decision making, allowing tourism stakeholders to analyze visitor behavior, personalize content, and optimize digital marketing strategies [6]. The application of digitalization inpreserving and promoting cultural heritage has also been recognized as a crucial factor in ensuring its sustainability in the modern era [7].

At the same time, the concept of green innovation has gained increasing attention in tourism development. Sustainable tourism practices, including environmentally friendly event management, waste reduction, and the use of eco friendly materials, are becoming essential in meeting the expectations of environmentally conscious tourists [8]. The integration of traditional knowledge with innovation has been shown to support the development of sustainable products and services while preserving cultural authenticity [9]. This approach aligns with global sustainability goals and the ASEAN tourism agenda, which emphasizes inclusive and sustainable tourism development. Therefore, combining local wisdom with technological advancement and environmental sustainability presents a promising approach for developing cultural tourism.

Despite the growing body of literature, there remains a significant research gap in integrating local wisdom, artificial intelligence, and green innovation within a unified framework. Most existing studies tend to examine these elements separately, focusing either on cultural preservation, digital transformation, or sustainability practices [5], [8]. Furthermore, limited research has explored how small scale local cultural events can be transformed into competitive tourism destinations through the synergy of these elements. This gap is particularly evident in the case of *Grebek Apem*, which has not been widely studied in the context of digital branding and sustainable tourism development.

This study offers a novelty contribution by proposing an integrated approach that combines local wisdom, AI driven digital branding, and green innovation to strengthen cultural tourism. Unlike previous studies, this research specifically focuses on *Grebek Apem Jombang* as a case study, highlighting its potential to be developed into a sustainable tourism destination comparable to well established cultural events. The novelty of this research lies in its interdisciplinary perspective, which connects cultural heritage, digital marketing, and sustainability into a comprehensive framework.

The purpose of this article is to explore strategies for strengthening local cultural wisdom through the integration of artificial intelligence and green innovation in the context of sustainable tourism development. This study aims to provide both theoretical insights and practical implications for stakeholders, including local governments, tourism practitioners, and communities. The structure of this article is organized as follow: Section 1 presents the introduction, Section 2 explains the research methodology, Section 3 presents the result and discussion, and Section 4 concludes the study.

1.1. Statement of Problem

The underutilization of local cultural traditions such as *Grebek Apem* as sustainable tourism assets reflects a lack of integration between cultural preservation, digital technology, and environmental sustainability. Although the tradition holds significant cultural value, it has not yet achieved optimal visibility or competitiveness in the tourism sector. The absence of AI Based digital promotion and limited implementation of green innovation practices further constrain its potential to attract broader audiences, particularly in the context of global tourism competition.

1.2. Research Objectives

This study aims to:

1. Analyze the potential of *Grebek Apem* as a cultural tourism attraction based on local wisdom.
2. Examine the role of artificial intelligence in enhancing digital branding and promotion.
3. Identify the application of green innovation in sustainable tourism development.

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4. Propose an integrated framework for strengthening local wisdom through AI and green innovation in the ASEAN context.

2. Method

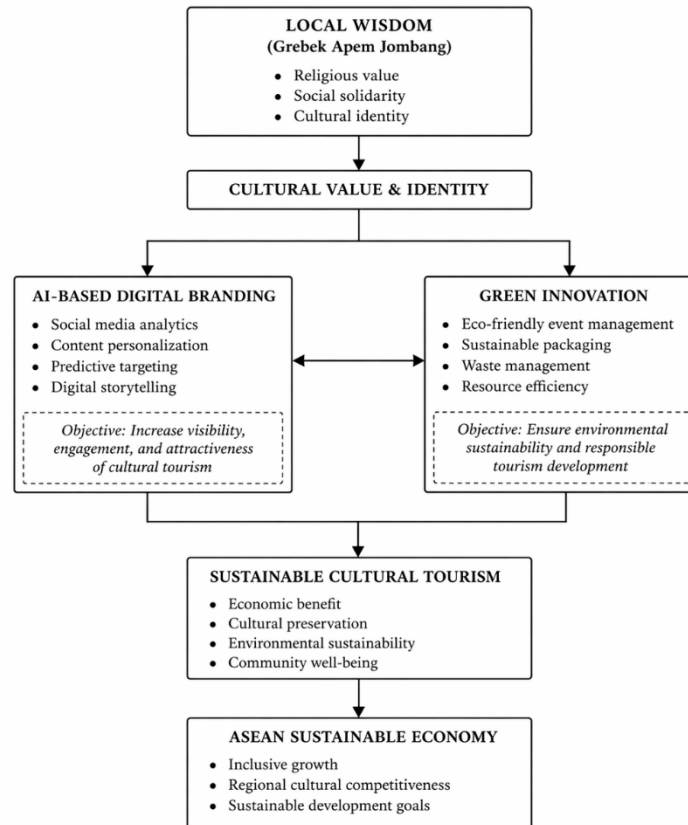
This study employs a qualitative research approach using a case study method to explore how local wisdom can be strengthened through the integration of artificial intelligence (AI) and green innovation in the context of sustainable cultural tourism. The qualitative approach is considered appropriate because this research seeks to understand social, cultural, and technological phenomena in depth, particularly related to the *Grebek Apem* tradition in Jombang. Qualitative methods enable researchers to capture contextual meanings, community perspectives, and cultural values that cannot be quantified directly [10].

Data collection was conducted through three main techniques: literature study, observation, and documentation. First, the literature study involved reviewing academic journals, books, and policy documents related to local wisdom, digital transformation, AI in tourism, and green innovation. This step aimed to build a strong theoretical foundation and identify relevant research gaps. Second, observation was conducted on the implementation of the *Grebek Apem* cultural event in Jombang, focusing on event activities, community participation, cultural elements, and existing promotional efforts. The observation was carried out during the cultural event period and supported by secondary sources such as online media and social media content. Third, documentation included collecting visual materials, reports, and digital content related to *Grebek Apem*, which were used to analyze current branding and promotional practices.

The data analysis technique follows a qualitative data analysis framework, including data reduction, data display, and conclusion drawing, as suggested by Miles and Huberman [11]. Data reduction was conducted by selecting and focusing on relevant information related to local wisdom, AI application, and green innovation. Data display was carried out by organizing findings into thematic categories, such as cultural value, digital branding, and sustainability practices. Finally, conclusions were drawn through interpretation and synthesis of the findings to develop an integrated conceptual framework.

To ensure the validity of the data, this study applies triangulation techniques, particularly source triangulation, by comparing findings from literature, observation, and documentation. This approach helps improve the credibility and reliability of the research results [12]. This study adopts a conceptual analytical framework that integrates three main components: local wisdom as the core cultural value, artificial intelligence as a tool for digital branding and promotion, and green innovation as a sustainability strategy. These components are interconnected to strengthen the development of *Grebek Apem* as a sustainable cultural tourism destination.

Figure 1. Integrated Framework for Strengthening Local Wisdom through AI and Green Innovation



3. Results and Discussion /Hasil dan Pembahasan

This section presents the findings based on qualitative data collected through observation, documentation, and semi-structured interviews related to the *Grebek Apem* tradition in Jombang. The analysis is organized into three main dimensions: local wisdom, digital transformation through artificial intelligence, and green innovation for sustainability. The findings are then synthesized into an integrated framework for sustainable cultural tourism development.

3.1 Local Wisdom as the Foundation of Cultural Tourism

The findings show that *Grebek Apem* represents strong local wisdom rooted in religious, social, and cultural values. The tradition is not merely ceremonial but reflects symbolic meanings such as gratitude, almsgiving, and community cohesion. This is consistent with the concept that local wisdom serves as a key element in strengthening cultural identity and tourism attractiveness [2].

Based on field observations, the event involves active participation from the local community, especially in the preparation and distribution of apem. This indicates a strong sense of collective ownership and cultural continuity.

Table 1. Summary of Findings on Local Wisdom and Tourism Potential

<u>Aspect</u>	<u>Findings</u>	<u>Challenges</u>	<u>Opportunities</u>
Cultural Value	Strong religious and social meaning	Limited external exposure	Cultural storytelling tourism
Community Participation	High involvement of local residents	Lack of structured organization	Community-based tourism
Tourism Potential	Unique cultural attraction	Not widely recognized	Destination development

The qualitative findings are further supported by interview data. A local community leader stated:

“Tradisi Grebek Apem ini sudah ada sejak lama dan menjadi bagian dari budaya masyarakat di sini. Maknanya adalah sedekah dan rasa syukur kepada Tuhan, tetapi memang belum banyak dikenal di luar daerah.”

This statement confirms that although the tradition has strong intrinsic value, its external visibility remains limited. Similar findings were also emphasized in previous studies that highlight the importance of local wisdom in creating cultural differentiation and tourism value [3].

Figure 2. Grebek Apem Cultural Procession



Source: Surya Jombang

In this figure 2 shows the distribution of apem to the community as part of a symbolic ritual gratitude. Community participation is highly visible, reflecting social cohesion.

Figure 3. Apem as Cultural Identity Product



Source: Kabupaten Jombang

In this figure 3 show the displays *apem* arranged in large quantities, representing both cultural heritage and potential culinary tourism attraction. These findings indicate that *Grebek Apem* has strong foundational value but requires strategic development to become a competitive tourism asset.

3.2 Artificial Intelligence for Digital Branding and Promotion

The second finding highlights the limited use of digital technology in promoting *Grebek Apem*. Current promotional efforts are mostly informal and rely on basic social media usage without structured digital marketing strategies.

From interview with event organizers:

“Selama ini promosi sudah melalui sosial media, seperti Instagram, Facebook, Tiktok, Youtube namun belum dimaksimalkan. Belum ada strategi khusus atau penggunaan teknologi yang lebih canggih. untuk tujuan pengenalan Grebek Apem ke wilayah luar seperti ke turis asing”

This condition reflects a gap between cultural potential and digital capability. In the context of smart tourism, digital technology, especially AI plays a crucial role in enhancing destination competitiveness [5].

AI based tools such as:

1. Social media analytics
2. Content personalization
3. Predictive audience targeting

can significantly improve digital visibility and engagement. Previous studies confirm that AI-driven marketing enables more effective communication and broader audience reach [6].

Table 2. Digital Promotion Analysis

<u>Aspect</u>	<u>Current Condition</u>	<u>Limitation</u>	<u>AI Based Opportunity</u>
Sosial Media	Basic usage	No strategy	Data driven marketing
Audience Targeting	Not defined	Low reach	AI segmentation
Content	Informational	Not engaging	Digital storytelling

In addition, digital storytelling supported by AI can transform *Grebek Apem* into a compelling narrative for global audiences. This aligns with research emphasizing the role of digitalization in preserving and transmitting cultural heritage [7].

Figure 4. Community Activities During Event



Source: Lingkar Wilis

Show the local community involvement in event preparation, but limited digital documentation and promotion are observed. These findings suggest that integrating AI into digital branding is essential for expanding the reach and attractiveness of the tradition.

3.3 Green Innovation for Sustainable Cultural Tourism

The third finding relates to environmental sustainability. Observations indicate that the current implementation of *Grebek Apem* has not fully adopted environmentally friendly practices. Waste management and the use of plastic materials remain significant issues.

A visitor noted:

“Acara ini menarik, tapi masih banyak sampah plastik. Mungkin ke depan bisa dibuat lebih ramah lingkungan.”

This finding aligns with global tourism trends, where sustainability has become a critical factor influencing tourist preferences [8].

Table 3. Green Innovation Analysis

<u>Aspect</u>	<u>Current Condition</u>	<u>Issue</u>	<u>Sustainable Solution</u>
Waste Management	Not managed	Environmental impact	Waste reduction system
Packaging	Plastic based	Not eco friendly	Biodegradable packaging
Event Management	Conventional	Not sustainable	Green event concept

Green innovation in this context includes:

1. Reducing plastic usage
2. Implementing waste management systems
3. Using eco friendly materials

This integration of traditional practices with innovation has been shown to enhance sustainability and competitiveness [9]. In the case of *Grebek Apem*, local knowledge can be combined with modern environmental practices to create a sustainable tourism model.

Figure 5. Environmental Condition and Community Involvement during *Grebek Apem* Event



Source: dlhjombang instagram

The figure illustrates the environmental conditions and community involvement during the *Grebek Apem* cultural event in Jombang. The images show active participation of student or local communities, including youth groups, in maintaining cleanliness by collecting waste

during and after the event. This reflects a growing awareness of environmental responsibility within the cultural celebration. However, it is also observed that waste, particularly plastic materials, is still present, indicating that sustainable waste management practices have not yet been fully implemented. These findings highlight the need for integrating green innovation strategies, such as structured waste management systems and eco friendly event practices, to support the development of sustainable cultural tourism.

3.4 Integrated Discussion: Towards Sustainable Cultural Tourism

The findings of this study confirm that the development of *Grebek Apem* as a sustainable tourism destination requires the integration of three key elements: local wisdom, artificial intelligence, and green innovation. Local wisdom provides cultural authenticity and identity, AI enhances visibility and marketing effectiveness, and green innovation ensures environmental sustainability. This integrated approach addresses the research gap identified in previous studies, which often examine these elements separately [5], [8].

From a theoretical perspective, this study supports the concept of value co-creation, where cultural, technological, and environmental resources are combined to create tourism value [13]. Practically, the findings suggest that stakeholders including local government, communities, and event organizers must collaborate to implement this integrated model.

Overall, the transformation of *Grebek Apem* into a sustainable tourism destination is not only possible but also highly relevant in the context of ASEAN sustainable economy. By leveraging innovation while preserving tradition, local cultural heritage can achieve greater recognition and long term sustainability.

4. Conclusion

This study concludes that *Grebek Apem Jombang* possesses strong potential to be developed as a sustainable cultural tourism destination through the integration of local wisdom, artificial intelligence (AI), and green innovation. The findings indicate that local wisdom serves as the foundation, reflected in the cultural, religious, and social values embedded in the tradition. However, its potential has not been fully optimized due to limited digital promotion and lack of structured event management. The study also finds that AI-based digital branding can significantly enhance visibility, audience engagement, and tourism attractiveness through data-driven marketing strategies and digital storytelling. In addition, the application of green innovation—such as environmentally friendly event management and sustainable packaging—can strengthen the appeal of *Grebek Apem* for environmentally conscious tourists. Therefore, the integration of these three elements provides a comprehensive approach to transforming *Grebek Apem* into a competitive and sustainable tourism asset in the ASEAN context.

This research contributes to the development of knowledge by proposing an integrated framework that combines local wisdom, artificial intelligence, and green

innovation in cultural tourism development. The novelty of this study lies in its interdisciplinary approach, which bridges cultural preservation with technological advancement and environmental sustainability within a single conceptual model. From a practical and policy perspective, this study provides strategic insights for local governments, tourism stakeholders, and communities to develop cultural tourism destinations more effectively. The findings highlight the importance of adopting AI-driven digital marketing strategies, strengthening community involvement, and implementing sustainable practices to ensure long-term impact. In addition, this study emphasizes that innovation does not replace tradition but rather enhances its relevance and value in the digital era.

Despite its contributions, this study has several limitations. First, the research is based on a single case study, which may limit the generalizability of the findings to other cultural contexts. Second, the study relies primarily on qualitative data, which may not capture measurable impacts such as economic performance or tourist satisfaction quantitatively. Therefore, future research is recommended to adopt a mixed-method approach by combining qualitative and quantitative analysis to provide more comprehensive insights. Comparative studies between different cultural events in Indonesia or ASEAN are also suggested to validate the proposed framework. Furthermore, future research can explore the implementation of specific AI tools and green innovation models in real tourism practices to evaluate their effectiveness in enhancing sustainable cultural tourism.

Content Attribution (If you use AI assistance):

The author acknowledges the use of ChatGPT (GPT-5.3, developed by OpenAI) in supporting several aspects of this study, including idea development, structuring of academic writing, and synthesis of theoretical perspectives. The AI application was utilized as a supportive tool to assist in organizing concepts and refining language in accordance with academic standards.

It is important to note that the content generated through AI assistance was not adopted verbatim. All outputs have been critically reviewed, interpreted, and refined by the author to ensure the accuracy, coherence, and relevance of the information presented. The author exercised independent judgment in validating the arguments, aligning them with the research context, and ensuring consistency with empirical observations and academic references.

Therefore, the final work represents a collaborative process in which AI functioned as an assistive instrument, while the author maintained full responsibility for the intellectual contribution, analysis, and integrity of the study.

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